Equine Session

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Feeding to Lose – Facilitating Weight Loss in Horses

Lori K. Warren, PhD, PAS
Associate Professor, Equine Nutrition
Department of Animal Sciences
University of Florida. Gainesville, FL

Take-Home Message

Obesity in horses has been linked with increased risk of laminitis and endocrine and metabolic disorders. The mismatch between caloric intake and energy expenditure is an underlying cause of excessive weight gain. Limiting energy intake to 70% of maintenance requirements can achieve a healthy rate of weight loss in most horses, although some horses may require more severe restriction. Grain, high-fat feeds, and high-calorie treats should be eliminated from the diet. Early- and mid-maturity legume and grass forages should be avoided in favor of late-maturity, somewhat stemmy grass-only hays. Along with hay, a protein-vitamin-mineral supplement should be fed to ensure the horse's vitamin, mineral, and protein requirements are still being met. In addition to reducing calories, the horse's desire to eat continuously can be pacified by employing methods to slow rate of intake (and prolong feeding time), such as feeding smaller more frequent meals and use of "slow-feed" hay nets and feeders. Whenever possible, dietary restriction should be combined with an increase in physical activity to be more effective.

Battle of the Bulge

Available data indicate that approximately one-third of all horses and ponies are overweight or obese, with the prevalence approaching 50% in some populations (Pratt-Phillips et al 2010; Thatcher et al 2012; Martinson et al 2014). Obesity in horses has been linked with increased risk of laminitis and endocrine and metabolic disorders (eg, equine metabolic syndrome, insulin resistance, hyperlipemia). Additionally, horses that are overweight often experience heat and exercise intolerance, exacerbation of osteoarthritis, and may be at greater risk for developing pedunculated lipomas which can lead to strangulation of the small intestine.

By strict definition, an "overweight" individual is one who is considered to be above their ideal bodyweight; however, this does not necessarily distinguish if the additional weight is muscle mass (such as that seen with athletes), or fat mass. In the context of the overweight horse, we are usually referring to those that are carrying around extra body fat. Somewhat easier to define is obesity, which is an individual who possesses an excessive amount of body fat to the extent where health may be adversely affected.

Body condition scoring systems are widely used to categorize horses and other animals as thin, moderate or overweight. Although there is no universal definition of obesity in equids, horses or ponies with a body condition score (BCS) of 7 (using the 9-point scale; Henneke et al 1983) are considered overweight, while animals with a BCS of 8 or 9 are obese (Carter & Dugdale 2013). While BCS systems are convenient to use, recent studies have found them to be limited in their reliability for assessing fat mass when BCS is ≥7 (ie, in overweight and obese horses) (Dugdale et al 2011, 2012). Essentially BCS systems provide a means for assessing superficial flesh (both fat and muscle), but they cannot accurately predict body fat content or the anatomic distribution of fat, the latter of which may be more relevant to the pathophysiology of obesity.

Both genetic and environmental factors (eg, diet, activity level) contribute to the onset of obesity. Nonetheless, a common denominator contributing to weight gain in most horses is an imbalance between caloric intake and energy expenditure over time. Thus, diet modification involving caloric restriction, along with alterations in feeding management are necessary to facilitate weight loss.

Dropping the Pounds

Getting Started

To achieve weight loss, it is necessary to produce a state of negative energy balance. The dieting adage "eat less, exercise more" for humans is also applicable to horses. The number of calories coming in must be less than the calories that are burned each day. While this translates to a reduction in digestible energy (DE) intake below daily requirements, it's important to emphasize that all other nutrient requirements (protein, minerals, vitamins) must continue to be met.

Before starting a weight loss program, an evaluation of the horse's medical history and a clinical examination should be performed. Baseline measurements of bodyweight (preferably with a scale), BCS, and morphometric measurements (eg, neck and abdominal circumferences) should be recorded so that comparisons can be made to evaluate the effectiveness of the weight loss program. Evaluation of the current feeding program and management system (eg, housing, feeding schedule, pasture access) should also be conducted, including measurement of the quantity of all feeds and supplements consumed (by weight), as well as the nutrient composition of each feed, so that energy intake can be accurately determined. The horse's current level of activity and the ability of the horse to participate in an exercise program should also be evaluated, as an increase in controlled physical activity will greatly aid in the quest to achieve the desired body weight.

Feeding Recommendations for Overweight and Obese Horses

For horses that are simply overweight (BCS 7), a reduction (or elimination) of calorie-dense feeds, restriction of pasture access, and an increase in physical activity may be sufficient to promote weight loss. However, for obese horses (BCS 8-9), more severe energy restriction may be needed to generate weight loss. Regardless of whether the horse is just overweight or is severely obese, the main objective is to gain control over what the horse eats so that calorie intake can be strictly managed. The following are some guidelines to consider:

1) Decrease (overweight horses) or eliminate (obese or overweight horses) grain, fat-added feeds and supplements, and high-calorie treats from the diet. Even "low-starch" commercial feeds may be too high in calories, particularly for obese horses. Although low in starch and sugar, many times these feeds contain added fat and may include beet pulp and/or soybean hulls, which are more calorie-dense than forages.

2) Limit (overweight horses) or eliminate (obese or overweight horses) access to pasture, particularly when growing forage is lush and abundant (spring and early summer). Ponies provided 24-hour access to pasture may consume up to 5% of body weight per day (as dry matter) and up to 1% BW (half to two-thirds of their recommended daily intake) in only 3 hours of pasture turnout (Longland et al 2011a,b). Thus, simply reducing turnout time may not be an effective practice for assisting with weight loss. Instead, it is preferable to maintain or turn horses out in a dry-lot, or to use a grazing muzzle to restrict grazing. In relatively short-term studies, grazing muzzles have been shown to reduce pasture DM intake by approximately 30% (Longland et al 2011b; Glunk et al 2014). However, in the author's

experience, grazing muzzles may become less effective at reducing intake in "seasoned" muzzle wearers. Alternatively, using portable fencing to confine horses to smaller grazing "cells" or strips, or use of picket-grazing for fixed periods of time may provide a means to garner some additional control over the quantity of forage available for grazing. Obese horses should be restricted completely from pasture and preferably maintained in a large dry-lot paddock.

3) The foundation of the overweight/obese horse's diet should be a long-stem hay with low to moderate DE content (< 2 Mcal/kg DM). Grass forages cut after heading (late maturity) are usually higher in fiber and lower in DE compared to grass hays harvested in early to mid-maturity. For similar reasons, grass hays are preferred over legumes for use in weight loss programs. In addition to being less energy-dense, mature, somewhat stemmy grass hays require more chewing and take longer to eat, occupying more of the horse's time, which may stave off hunger pains and help prevent gastric ulcers and stereotypies associated with boredom. Although a more mature hay is desirable, it should still be free of dust, mold and trash. If the horse has a history of laminitis or has been diagnosed with insulin resistance or equine metabolic syndrome, it's also important to select a hay with a non-structural carbohydrate (NSC) content of less than 10-12% (dry matter basis). Soaking hay has also been shown to reduce the NSC and DE content of hay, although the extent of the losses vary by hay type, maturity, soaking time, and water temperature, and other essential nutrients may also be lost (Longland et al 2011c; McGowan et al 2013; Martinson et al 2012a,b). Although a greater initial investment in equipment, hay steamers have also been shown to moderately reduce the sugar content of hay (Earing et al 2013).

   For some overweight horses, simply changing from a higher-nutrient content hay to a late-maturity grass hay may help encourage weight loss, particularly if offered in measured portions rather than free-choices (eg, 2% BW, DM basis). For other overweight horses and those that are obese, providing hay at no more than 1.5% of current body weight (DM basis) can start the weight loss process. If minimal weight loss is observed after 6 to 8 weeks, then this quantity can be decreased to 1.25% BW (DM basis). A further decrease to 1% BW (DM basis) can be implemented, if necessary; however, it is important to not go any lower than 1% BW as it can increase the risk for digestive dysfunction, gastric ulcers and stereotypic behaviors (eg, wood chewing, caprophagy). Dugdale et al (2010) fed Welsh Mountain pony mares a chaff-based complete diet restricted to 1% BW (providing 67% of maintenance DE requirements) for 12 weeks and observed an average weight loss of 1% of BW weekly. More recent studies by the same group indicated weight loss could be achieved with less severe energy restriction. Mature overweight/obese ponies and horses fed grass hay and a ration balancer, or grass hay and a chaff-based complete feed at 1.25% BW for 16 weeks resulted in a mean weekly loss of 0.5% BW (Argo et al 2012). However, 4 of the 12 study horses exhibited minimal weight loss and required greater dietary restriction. In a shorter term study, mature ponies and horses with equine metabolic syndrome fed 1.25% BW soaked hay and a vitamin-mineral supplement lost an average of 6.8% of body mass (~1.2% BW per week) (McGowan et al 2013). Thus, a reasonable rate of weight loss of 0.5-1% BW per week can be achieved by feeding restricted quantities (1-1.5% BW, DM basis) of a hay with a low to moderate DE content. Typically, weight loss has been shown to improve glucose tolerance and/or insulin sensitivity, with significant improvements observed within as few as 6 weeks of starting dietary restriction (McGowan et al 2013).

4) A vitamin-mineral supplement or a ration balancer (protein-vitamin-mineral supplement) should be added to the diet of calorie-restricted horses. Use of a lower quality hay to elicit weight loss often results in consumption of insufficient quantities of vitamins and minerals, and in some cases protein. In humans, and presumably horses, adequate intake of essential

amino acids while dieting is important for preventing loss of lean tissue. Ration balancers offer the means to provide a potent source of high quality protein, as well as make up the deficit in vitamins and minerals, without drastically increasing the daily caloric load. In this manner, a negative energy balance can be created with dietary restriction while still meeting the horse's other requirements.

5) Key to the success of a weight loss program is providing measured quantities, rather than eyeball estimates (eg, flakes, scoops) of hay and other feedstuffs in the ration. Desired amounts of each feed should be weighed daily to ensure consistency and to better evaluate the effectiveness of the weight loss program.

6) All changes to the diet (quantity, feed source) should be made gradually over 7 to 10 days to avoid digestive, and possibly metabolic upset. Withholding feed for prolonged periods should be avoided. Abrupt starvation ("crash diets"), particularly in obese ponies, donkeys and miniature horses carries a risk of hyperlipemia and is not recommended. Further, severe restriction of forage (< 1% BW, DM basis) can increase risk of gastric ulcers, as well as the development of stereotypic behavior.

7) The horse's weight loss progress (via changes in body weight, BCS, neck circumference, abdominal circumference) should be evaluated every 4 to 6 weeks and appropriate adjustments made to the quantities of feed offered.

Additional Management Tools

In addition to implementing dietary restriction, modifying other aspects of feeding and general management can contribute to the overall success of a weight loss program. For example, the hierarchy within a horse herd can contribute to weight gain (or loss) in some horses. When group-fed, the dominant horses in the herd may be eating more than their fair share. Overweight and obese horses should be isolated during feeding time, to help best control daily intake.

A major drawback to any weight loss program is, by necessity, the reduction in total feed intake. Horses have adapted as continuous grazers, with a natural inclination to eat 10-16 hours a day. When less feed is offered, less time is spent eating. Infrequent meals can increase risk of gastric ulcers. Additionally, the dieting horse is prone to developing stereotypic behaviors, particularly if housed in a stall. Therefore, every effort should be made to slow the rate of feed intake and prolong feeding time. This can be accomplished by dividing the daily allotment of hay into 3-5 smaller meals, double-netting hay, using hay nets/bags with small openings (slow feeders), using specialized feeders that restrict bite size, or spreading out hay in multiple locations in the horse's paddock. Inserting obstacles (bocce balls) into the feed tub or an insert that created dips in the base of the tub increased feeding time by almost 50% (Kutzner-Mulligan et al 2013). Similarly, horses took 45% longer to consume a meal of concentrate when feed was provided in a commercial feeder with molded cups on the bottom (Pre-Vent feeder) compared to a traditional bucket (Carter et al 2012). Although time spent eating was not extended, horses ate 20% less hay when it was provided in a commercial poly-web net with 1.5-inch square openings (Nibblenet) compared to hay provided loose on the ground (Aristizabal et al 2014).

Lastly, whenever possible, dietary restriction should be combined with an increase in physical activity. Skeletal muscle is the biggest user of calories, and exercise can help maintain a stronger metabolism to sustain weight loss to achieve (and maintain) the horse's ideal body weight. Owners need to be encouraged to start exercising their overweight/obese horse (even hand-walking is better than nothing) or increasing the frequency and duration of an existing training program. Simply leaving the horse to exercise itself in a paddock or pasture is likely not going to be as effective as a structured training program. A small number of studies have

evaluated some novel ways to encourage sedentary horses to self-exercise while in their pasture or a dry-lot paddock. Hampson et al (2013) created a dynamic feeding system that forced horses to walk greater distances to retrieve their hay. However, use of internal fences to create racetrack, maze and spiral designs in an effort to force horses to self-exercise while grazing did not significantly affect mean distance travelled Hampson et al (2010).

Metabolic and Weight Loss Supplements

A number of supplements (often containing magnesium, chromium, cinnamon, omega-3 fatty acids, or various herbs) are marketed with claims for improved metabolic control and, secondarily, promotion of weight loss; however, there is little scientific evidence to support their effectiveness in overweight or obese horses or in those with metabolic dysfunction. Omega-3 fatty acid supplementation has been proposed to improve insulin responsiveness in human diabetic patients. In horses, a relatively low dose of fish oil failed to alter the glucose and insulin response to a high starch meal (Vervuert et al 2010a). Another study adapted horses to a larger quantity of fish oil and observed a lower glucose response after a dose of glucose, but insulin sensitivity was not improved (Hoffman et al. 2011). Conjugated linoleic acid (specifically the *trans*-10, *cis*-12 isomer) is known for its anti-adipogenic properties; however, supplementation with conjugated linoleic acid (0.0055% BW) for 6 wk did not alter body fat in healthy, normal-weight horses (Headley et al 2012). Supplementation of metabolically normal ponies with lipoic acid (10 mg/kg BW) reduced insulin response to an intravenous dose of glucose (Berg et al 2011); however, its usefulness as an insulin sensitizing agent needs to be more stringently evaluated in insulin resistant horses. Cinnamon is found in several dietary supplements marketed for horses with metabolic disorders, likely based on reports of altered insulin signaling in response to cinnamon extract in rats. However, cinnamon extract (1.5 g/d) supplementation failed to improve insulin sensitivity in horses known to be insulin resistant (Earl et al 2011). Chromium is a mineral that is often found in dietary supplements for overweight horses or those with metabolic dysfunction because it is thought to augment insulin action and improve glucose disposal. Chromium yeast (2 g/d) fed to insulin resistant overweight horses and ponies for 4 wk resulted in a moderate decrease in peak insulin concentrations, but no change in plasma glucose in response to an oral dose of starch (Vervuert et al 2010b). While chromium may have facilitated insulin signaling, the authors commented that the ponies and horses still had exaggerated glucose and insulin responses to the starch compared to normal horses. A mixed supplement containing chromium (5 g/d) and magnesium (8.8 g/d) administered to laminitic overweight and obese horses for 16 weeks had no effect on body weight or other morphometric measurements, resting insulin, nor insulin sensitivity in response to an insulin-modified frequently sampled i.v. glucose tolerance test (Chameroy et al 2011).

Increased consumption of soluble, pre-biotic fibers has been shown to modulate glucose and insulin response in diabetic humans. In horses, supplementation with psyllium was shown to lower postprandial glucose and insulin in responses (Moreaux et al 2011), and supplementation with short-chain fructo-oligosaccharides was shown to improve insulin sensitivity (Respondek et al 2011). In contrast, 6 wk of fructo-oligosaccharide supplementation combined with diet restriction in mature, overweight or obese horses with EMS yielded no further improvements in glucose or insulin response that diet restriction alone (McGowan et al 2013). The addition of small quantities of pectin to a grain meal also had no effect on glucose or insulin response (Vervuert et al 2009). Despite the promise of these soluble, pre-biotic fibers for improving insulin dynamics and function, results thus far have been somewhat inconsistent.

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Notes